



Plant Community Composition and Structure Monitoring at Scotts Bluff National Monument

2018 Data Report

Natural Resource Data Series NPS/NGPN/NRDS—2019/1213



ON THE COVER

Plant Community Composition and Structure Monitoring plot SCBL_PCM_0005 at Scotts Bluff National Monument, May 2018.
Photograph courtesy of the National Park Service.

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Abstract

This report presents the results of vegetation monitoring efforts in 2018 at Scotts Bluff National Monument (SCBL) by the Northern Great Plains Inventory and Monitoring Network (NGPN) and Fire Ecology Program (NGPFire). This was the eighth year of combined monitoring efforts.

Crew members from NGPN visited eight long-term monitoring plots to collect data on the plant communities at SCBL. This work is part of a long-term monitoring effort designed to provide a better understanding of the condition of the vegetation community and how it changes over time. NGPN staff measured species richness, herb-layer height, native and non-native species abundance, ground cover, and site disturbance at each of the plots. In plots where woody species were present, tree regeneration, tall shrub density, tree density, and woody fuel loads were also measured. An additional four plots were visited that had been originally established by the Heartland Network to evaluate the effectiveness of a restoration project. The NGPFire crew visited an additional eleven plots in the Eagle Rock and South Bluff Burn Unit to better understand the effects of prescribed fire on vegetation. The NGPFire crew measured herb-layer height, native and non-native species abundance, ground cover, and site disturbance at each of the plots.

In 2018, the monitoring crews identified 103 unique plant species in 23 monitoring plots. Of those species, 17 were exotic species. On average, the absolute cover of exotic species was much greater than the absolute cover of native species. A number of species considered rare in Nebraska were observed in the plots, including spotted fritillary, *Fritillaria atropurpurea*. These species are more common globally but western Nebraska is the edge of their range.

Acknowledgments

We thank all the authors of the NGPN Plant Community Monitoring Protocol, particularly A. Symstad, for outstanding guidance on data collection and reporting. Thank you to the staff at SCBL for providing logistical support and donuts, particularly J. Cawiezel, K. Charbonneau, and D. Morford. We thank R. Manasek for his help with fieldwork during retirement. The 2018 NGPN vegetation field crew—C. Davis, I. Ashton, R. Manuel, T. Schaffner, M. Davis, R. Oltjenbruns, and S. Rockwood — and NGPFire crew- D. Swanson, K. Ronsani, I. Muirhead, and J. Roy- collected the data included in this report.

Introduction

Scotts Bluff National Monument (SCBL) was established in 1919 to protect and preserve two iconic bluffs and the associated heritage of western expansion. It covers 3,003 acres and is dominated by mixed-grass prairie with smaller areas of juniper woodlands, badlands, and riparian forests.

Vegetation monitoring began at SCBL in 1997 by the Heartland Inventory & Monitoring Program (James 2010) and the Northern Great Plains Fire Ecology Program (NGPFire; Wienk et al. 2011). In 2010, SCBL was incorporated into the Northern Great Plains Inventory & Monitoring Network (NGPN). At that time, vegetation monitoring protocols and plot locations (Figure 1) were shifted to better represent the entire park and to coordinate efforts with NGPFire (Symstad et al. 2012b). A total of 34 plots were established by NGPFire and NGPN in SCBL and the combined sampling efforts began in 2011 (Ashton and Davis, 2016). In 2014, an additional 20 plots were established in the riparian forest to assess forest condition. In this report, we provide summaries of the data collected in 2018 at eight upland plots. For a more in-depth data report on long-term trends in vegetation at SCBL, refer to the 2011-2015 summary report (Ashton and Davis, 2016).

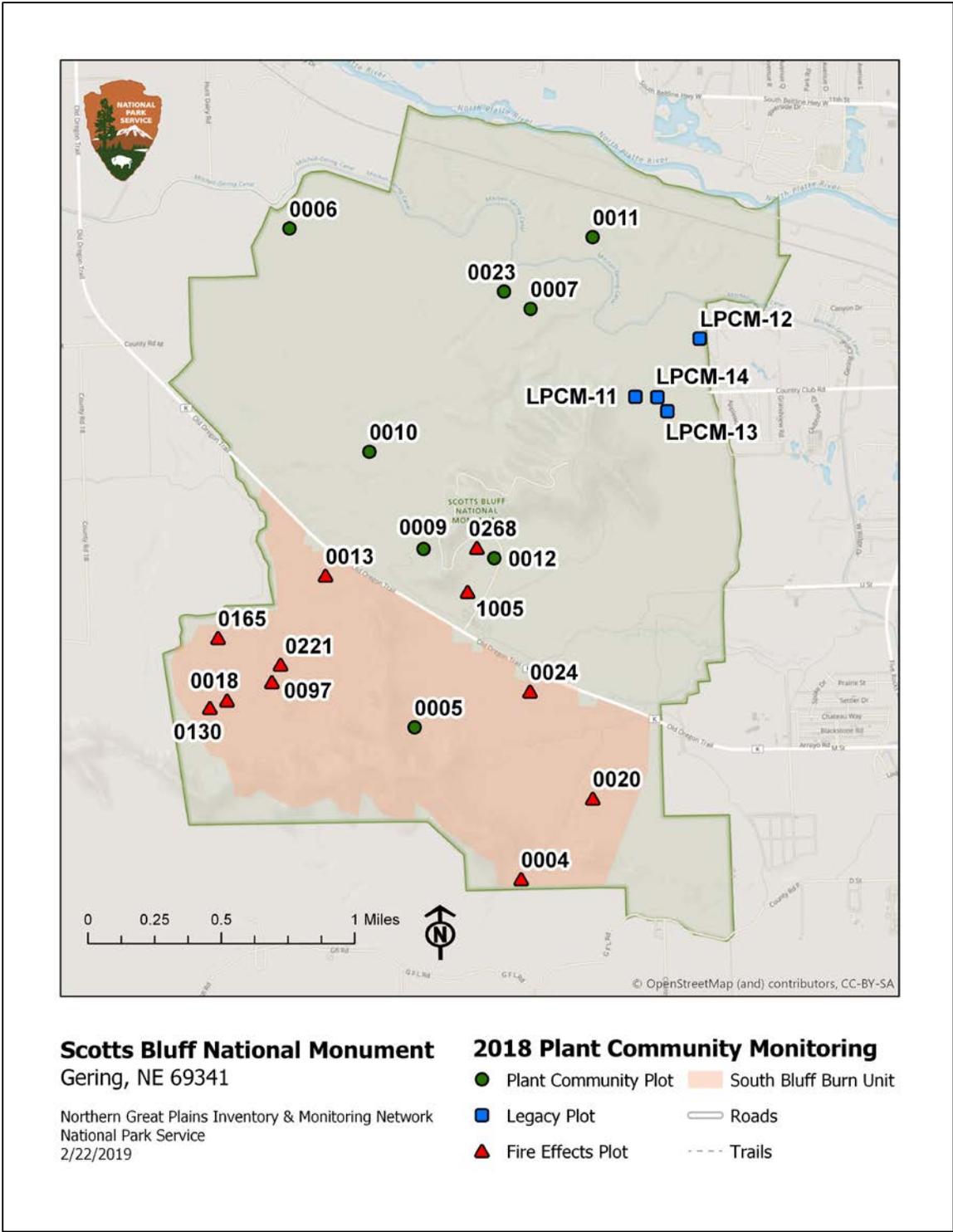


Figure 1. Map of Scotts Bluff National Monument plant community monitoring plots visited in 2018 by the Northern Great Plains Network Inventory & Monitoring Program (green and blue markers) and the Fire Ecology Program (red markers).

Methods

The NGPN Plant Community Composition and Structure Monitoring Protocol (Symstad et al. 2012b, a) describes in detail the methods used for sampling long-term plots. The general approach is briefly described below. For more detail, please see the monitoring protocol and standard operating procedures, available at <https://www.nps.gov/im/ngpn/plant-communities.htm>.

Sample Design

The NGPN team implemented a survey to monitor plant community structure and composition at SCBL using a spatially balanced probability design (Generalized Random Tessellation Stratified [GRTS]; Stevens and Olsen 2003, 2004). Using a GRTS design, 20 randomly located sites were selected within SCBL to be established as Plant Community Monitoring plots (PCM plots). These sites were split into five panels, with four sites in each panel. An NGPN crew visits four plots from each panels (eight PCM plots total) during late May every year, using a rotating sampling scheme that consists of half the plots visited the previous year, and the remaining plots having been visited four years prior. Data from these randomly selected sites can be used to estimate the condition of vegetation communities for the whole park and to discern trends in condition over time. In 2018, the NGPN crew visited sites in panels 2, and 3 (Figure 1). An additional four plots that were originally established by the Heartland Network to study the effectiveness of the golf course restoration project were revisited in 2018. These monitoring plots are referred to as legacy plots or LPCM. Sampling was completed by two NGPN crews at these 12 plots over four days (Table 1).

The NGPFire crew has established sites using the same GRTS design, but those plot locations are not randomly selected. Rather, they are focused in active burn units. The NGPFire crew also visits established PCM plots (described above) that fall within burn units. In 2018, two sites were established and monitored in the Eagle Rock unit and nine sites were visited in the South Bluff Unit (Figure 1).

Table 1. Field journal for monitoring plot visits at Scotts Bluff National Monument in 2018. A total of 23 plots were visited by Northern Great Plains Inventory & Monitoring and Fire Ecology Programs.

Date Visited	Plot Name	Field Notes
May 21, 2018	PCM_0005	Diverse plot
	PCM_0009	Plot markers were difficult to find. Second half of plot read May 22.
	PCM_0012	–
May 22, 2018	PCM_0006	–
	PCM_0007	–
	PCM_0010	Plot markers were difficult to find.
	PCM_0023	–

Table 1 (continued). Field journal for monitoring plot visits at Scotts Bluff National Monument in 2018. A total of 23 plots were visited by Northern Great Plains Inventory & Monitoring and Fire Ecology Programs.

Date Visited	Plot Name	Field Notes
May 23, 2018	PCM_0011	One NGPN crew at SCBL, the other worked at Agate Fossil Beds NM
	LPCM_11	–
	LPCM_13	–
	LPCM_14	–
May 24, 2018	LPCM_12	One NGPN crew at SCBL, the other worked at Agate Fossil Beds NM
May 31, 2018	FPCM_0268	Plot installed and read; Eagle Rock
June 4, 2018	PCM_0013	South Bluff
June 5, 2018	FPCM_0130	South Bluff
	FPCM_0165	South Bluff
	PCM_0018	South Bluff
	PCM_0024	South Bluff
June 6, 2018	FPCM_0097	South Bluff
	FPCM_0221	South Bluff
	PCM_0004	South Bluff
	PCM_0020	South Bluff
June 7, 2018	FPCM_1005	Plot installed and read; Eagle Rock

Plot Layout and Sampling

At each site visited, the NGPN crew recorded plant species cover and frequency in a rectangular, 50 m x 20 m (0.1 ha), permanent plot (Figure 2). Data on ground cover, herb-layer height (≤ 2 m), and plant cover were collected on two 50 m transects (the long sides of the plot) using a point-intercept method (Figure 3). Species richness data from the point-intercept method were supplemented with species presence data collected in five 1 m² quadrats located systematically along each transect (Figure 2). If a plant species was identified in the plot but was not included on the verified park species list, a voucher plant specimen was collected when possible and submitted to a botanist for independent verification. NGPFire collected point-intercept data at all FPCM and PCM plots but did not collect species presence data from the quadrats nor were quadrats assessed in LPCM plots.

When woody species were present within 38 m of plot center, tree regeneration and tall shrub density data were collected within a 10 m radius subplot centered in the larger 50 m x 20 m (0.1 ha) plot. Trees within the entire 0.1 ha plot with a diameter at breast height (DBH) of > 15 cm were mapped and tagged. For each tree, the species, DBH, status (live or dead), and condition (e.g., leaf-discoloration, insect-damaged) were recorded. For all poles ($2.54 \leq \text{DBH} \leq 15$ cm) located within the 10 m radius subplot, only DBH and status were recorded. Tree and tall shrub species with $\text{DBH} < 2.54$ cm (seedlings) were tallied by species within the 10 m radius subplot. In 2018, NGPN changed the way these species counts were made. Previously, once the count for a species had reached 100, seedlings of that species were not counted in the following quarters and a calculated estimate was

made when the data was analyzed. Now, all seedling species present are always counted or estimated in all four quarters of the 10 m radius subplot while in the field. Dead and downed woody fuel load data were collected along two perpendicular, 100 ft (30.49 m) transects (fuel lines) with midpoints at the center of the plot (Figure 2), following Brown’s Line methods (Brown 1974, Brown et al. 1982). Fuel load data were only collected if at least one piece of woody litter or fuel intersected a fuel line.

Common disturbances were assessed and documented at each plot. The type of disturbance, such as animal trails, erosion or prairie dogs was recorded. In 2018 a new category called soil disturbance was added, which is defined as loose, exposed soil from all sources. Plots were also assessed for the presence and abundance of target exotic species (Table 2), which is critical for early detection and rapid response to exotic species threats. These species were chosen in collaboration with the Midwest Invasive Plant Network, Northern Great Plains Exotic Plant Management Team, park managers, and local weed experts. Each target species was assigned an abundance class from 1–5, based on an ocular estimate of cover, where 1 = one individual, 2 = few individuals, 3 = cover of 1–5%, 4 = cover of 5–25%, and 5 = cover > 25% of the plot.

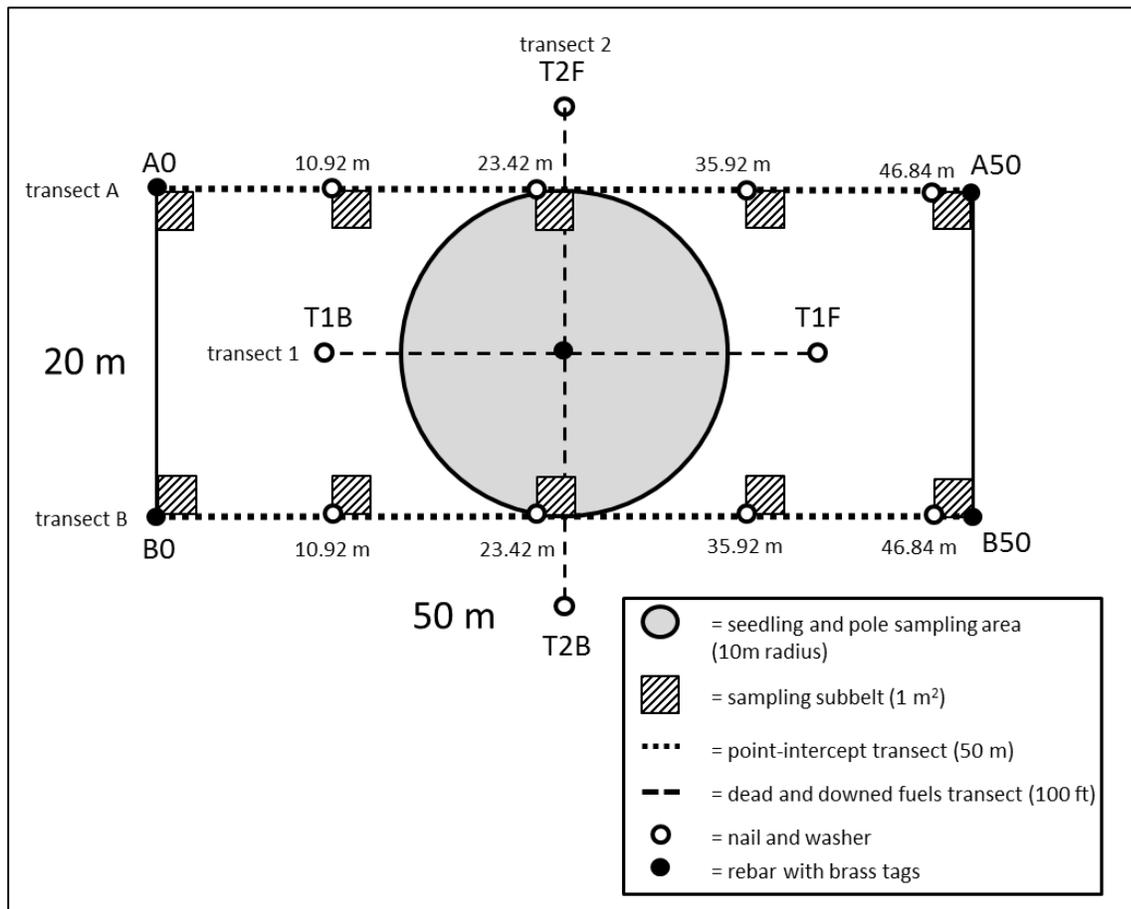


Figure 2. Long-term monitoring plot layout used for sampling vegetation used by the Northern Great Plains Inventory and Monitoring vegetation crew.

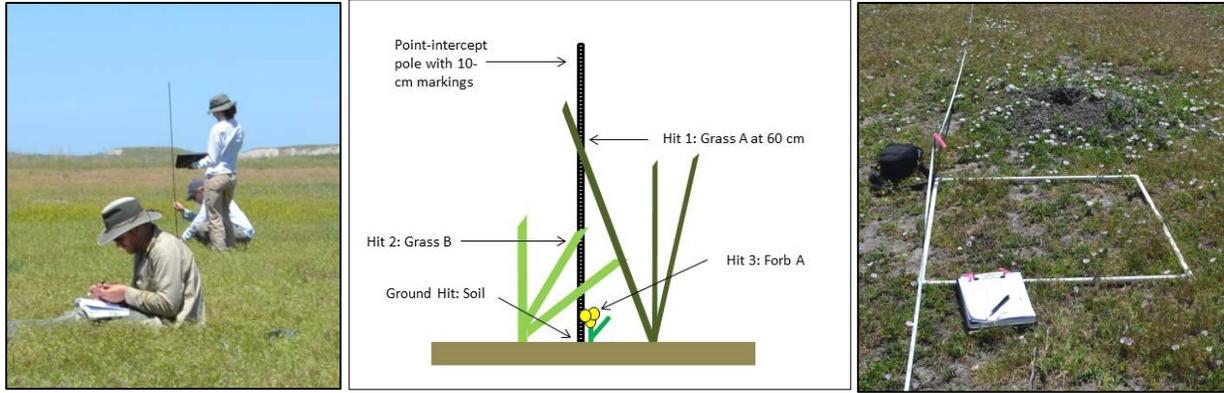


Figure 3. The Northern Great Plains Inventory & Monitoring vegetation crew used point-intercept (left and center panel) and quadrats (right panel) to document plant diversity and abundance.

Table 2. Exotic species included in the Northern Great Plains Network’s early detection and rapid response program.

Habitat	Scientific Name	Common Name
Riparian	<i>Alliaria petiolata</i>	garlic mustard
Riparian	<i>Polygonum cuspidatum</i> ; <i>P. sachalinense</i> ; <i>P. x bohemicum</i>	knotweeds
Riparian	<i>Pueraria montana var. lobata</i>	kudzu
Riparian	<i>Iris pseudacorus</i>	yellow iris
Riparian	<i>Ailanthus altissima</i>	tree of heaven
Riparian	<i>Lepidium latifolium</i>	perennial pepperweed
Riparian	<i>Arundo donax</i>	giant reed
Riparian	<i>Rhamnus cathartica</i>	common buckthorn
Riparian	<i>Heracleum mantegazzianum</i>	giant hogweed
Upland	<i>Centaurea solstitialis</i>	yellow star thistle
Upland	<i>Hieracium aurantiacum</i> ; <i>H. caespitosum</i>	orange and meadow hawkweed
Upland	<i>Isatis tinctoria</i>	Dyer’s woad
Upland	<i>Taeniatherum caput-medusae</i>	medusahead
Upland	<i>Chondrilla juncea</i>	rush skeletonweed
Upland	<i>Gypsophila paniculata</i>	baby’s breath
Upland	<i>Centaurea virgata</i> ; <i>C. diffusa</i>	knapweeds
Upland	<i>Linaria dalmatICA</i> ; <i>L. vulgaris</i>	toadflax
Upland	<i>Euphorbia myrsinites</i> & <i>E. cyparissias</i>	myrtle spurge
Upland	<i>Dipsacus fullonum</i> & <i>D. laciniatus</i>	common teasel
Upland	<i>Salvia aethiopsis</i>	Mediterranean sage
Upland	<i>Ventenata dubia</i>	African wiregrass

Data Management and Analysis

FFI (FEAT/FIREMON Integrated; <http://frames.gov/ffi/>) was the primary software environment used for managing our sampling data. FFI is used by a variety of agencies (e.g., NPS, USDA Forest Service, U.S. Fish and Wildlife Service), has a national-level support system, and generally conforms to the Natural Resource Database Template standards established by the Inventory and Monitoring Program. Species scientific names, codes, common names, and native status are from the USDA Plants Database (USDA-NRCS 2018). However, nomenclature follows the Integrated Taxonomic Information System (ITIS). In the few cases where ITIS recognized a new name that was not in the USDA PLANTS database, the new name was used, and a unique plant code was assigned.

After data were entered in the database, 100% of records were verified with the original data sheets to minimize transcription errors, followed by a 10% review of records to confirm accuracy. Automated queries were used to check for any remaining errors in the data. When errors were identified by the crew or the automated queries, corrections were made to the original datasheets and the FFI database.

Data summaries were produced using the FFI reporting and query tools. The number of species encountered in each plot was calculated using data from point-intercept, quadrat, woody species, and target species protocols. Absolute cover was calculated using point-intercept data and is the total number of vegetation intercepts. This is often greater than 100% because more than one species can be intercepted per point due to overlapping vegetation.

The conservation status rank of plant species observed at SCBL in 2018 was determined by cross-referencing with the NatureServe conservation status list, as well as the Nebraska rare plant species lists. For the purpose of this report, a species is considered rare or of conservation concern if its global (G) or state (S) conservation status rank is classified as critically imperiled (G1/S1), imperiled (G2/S2), or vulnerable (G3/S3). The 2018 species list was also cross-referenced with the list of county and state noxious weeds maintained by the [Nebraska Department of Agriculture](#).

Results

There are 515 vascular plant species on the [SCBL species list](#), and NGPN and NGPFire monitoring crews identified a total of 103 species from 23 monitoring plots in 2018 (Table 3). Of these species, 17 are exotic or unknown origin species for the park. The 2018 species list was cross-referenced with state-wide rare and noxious exotic species lists for Nebraska. We did not identify any noxious weeds in our 2018 vegetation monitoring plots. We identified nine rare plant species in SCBL monitoring plots in 2018 (Table 3). Three of these are critically imperiled (S1) in Nebraska: slender wheatgrass (*Elymus trachycaulus*), western tansymustard (*Descurainia pinnata*) and hairy false goldenaster (*Heterotheca villosa*). Five other species were ranked either imperiled to apparently secure (S2S4) or vulnerable to secure (S3S5). In most cases, only one subspecies of these plants is considered rare and since our monitoring protocols are to only identify plants to the species level, it is possible, but unlikely, that the rare subspecies occurs in SCBL. All rare species observed are classified as secure (G5) at the global scale, but are rare in the state because they exist on the edge of their global range in Nebraska. All the species we detected are on the SCBL species list.

Table 3. List of all plant species identified in Scotts Bluff National Monument plant community monitoring plots in 2018. In the Notes column, “Exotic” indicates that a species is not native to the park or, in the case where only the genus was identified, there are some species within that genus that are exotic. State or county noxious weed species are designated in the Notes column. Rare species are indicated in the Notes column with the Nebraska state ranking.

Family	Species Code	Scientific Name	Common Name	Notes
Agavaceae	YUGL	<i>Yucca glauca</i>	soapweed yucca	–
Anacardiaceae	RHAR4	<i>Rhus aromatica</i>	fragrant sumac	–
Anacardiaceae	RHTR	<i>Rhus trilobata</i>	skunkbush sumac	–
Anacardiaceae	TORY	<i>Toxicodendron rydbergii</i>	western poison ivy	–
Asclepiadaceae	ASPU	<i>Asclepias pumila</i>	plains milkweed	–
Asclepiadaceae	ASSP	<i>Asclepias speciosa</i>	showy milkweed	–
Asteraceae	AMPS	<i>Ambrosia psilostachya</i>	Cuman ragweed	–
Asteraceae	ARDR4	<i>Artemisia dracunculus</i>	tarragon	–
Asteraceae	ARFI2	<i>Artemisia filifolia</i>	sand sagebrush	–
Asteraceae	ARFR4	<i>Artemisia frigida</i>	fringed sagewort	–
Asteraceae	COCA5	<i>Conyza canadensis</i>	horseweed	–
Asteraceae	ERNA10	<i>Ericameria nauseosa</i>	rubber rabbitbrush	S2S4
Asteraceae	GUSA2	<i>Gutierrezia sarothrae</i>	broom snakeweed	–
Asteraceae	HELIA3	<i>Helianthus</i>	sunflower	–
Asteraceae	HEVI4	<i>Heterotheca villosa</i>	hairy false goldenaster	S1
Asteraceae	LASE	<i>Lactuca serriola</i>	prickly lettuce	exotic

Table 3 (continued). List of all plant species identified in Scotts Bluff National Monument plant community monitoring plots in 2018. In the Notes column, “Exotic” indicates that a species is not native to the park or, in the case where only the genus was identified, there are some species within that genus that are exotic. State or county noxious weed species are designated in the Notes column. Rare species are indicated in the Notes column with the Nebraska state ranking.

Family	Species Code	Scientific Name	Common Name	Notes
Asteraceae	LYJU	<i>Lygodesmia juncea</i>	rush skeletonplant	–
Asteraceae	MUOB99	<i>Mulgedium oblongifolium</i>	blue lettuce	–
Asteraceae	PACA15	<i>Packera cana</i>	woolly groundsel	–
Asteraceae	PAPL12	<i>Packera plattensis</i>	prairie groundsel	–
Asteraceae	SERI2	<i>Senecio riddellii</i>	Riddell's ragwort	–
Asteraceae	SOMO	<i>Solidago mollis</i>	velvety goldenrod	–
Asteraceae	SYER	<i>Symphyotrichum ericoides</i>	white heath aster	S3S5
Asteraceae	SYMPH4	<i>Symphyotrichum</i>	aster	–
Asteraceae	TAOF	<i>Taraxacum officinale</i>	common dandelion	exotic
Asteraceae	THME	<i>Thelesperma megapotamicum</i>	Hopi tea greenthread	–
Asteraceae	TRDU	<i>Tragopogon dubius</i>	yellow salsify	exotic
Boraginaceae	LAOC3	<i>Lappula occidentalis</i>	flatspine stickseed	–
Brassicaceae	ALDE	<i>Alyssum desertorum</i>	desert madwort	exotic
Brassicaceae	DEPI	<i>Descurainia pinnata</i>	western tansymustard	S1
Brassicaceae	DRRE2	<i>Draba reptans</i>	Carolina draba	–
Brassicaceae	ERCA14	<i>Erysimum capitatum</i>	sanddune wallflower	–
Brassicaceae	SIAL2	<i>Sisymbrium altissimum</i>	tall tumbledustard	exotic
Cactaceae	OPPO	<i>Opuntia polyacantha</i>	plains pricklypear	–
Cactaceae	OPUNT	<i>Opuntia</i>	pricklypear	–
Caprifoliaceae	SYOC	<i>Symphoricarpos occidentalis</i>	western snowberry	–
Chenopodiaceae	CHENO	<i>Chenopodium</i>	goosefoot	exotic
Chenopodiaceae	KOSC	<i>Kochia scoparia</i>	burningbush; kochia	exotic
Chenopodiaceae	KRLA2	<i>Krascheninnikovia lanata</i>	winterfat	S3S5
Chenopodiaceae	SATR12	<i>Salsola tragus</i>	prickly Russian thistle	exotic
Commelinaceae	TROC	<i>Tradescantia occidentalis</i>	prairie spiderwort	–
Cupressaceae	JUSC2	<i>Juniperus scopulorum</i>	Rocky Mountain juniper	–
Cyperaceae	CADU6	<i>Carex duriuscula</i>	needleleaf sedge	–
Cyperaceae	CAFI	<i>Carex filifolia</i>	threadleaf sedge	–

Table 3 (continued). List of all plant species identified in Scotts Bluff National Monument plant community monitoring plots in 2018. In the Notes column, “Exotic” indicates that a species is not native to the park or, in the case where only the genus was identified, there are some species within that genus that are exotic. State or county noxious weed species are designated in the Notes column. Rare species are indicated in the Notes column with the Nebraska state ranking.

Family	Species Code	Scientific Name	Common Name	Notes
Cyperaceae	CAREX	<i>Carex</i>	sedge	–
Euphorbiaceae	CRTE4	<i>Croton texensis</i>	Texas croton	–
Euphorbiaceae	EUPHO	<i>Euphorbia</i>	spurge; sandmat	–
Fabaceae	ASFL2*	<i>Astragalus flexuosus*</i>	flexile milkvetch*	–
Fabaceae	ASGR3	<i>Astragalus gracilis</i>	slender milkvetch	–
Fabaceae	ASTRA	<i>Astragalus</i>	milkvetch	–
Fabaceae	DACA7	<i>Dalea candida</i>	white prairie clover	–
Fabaceae	LAPO2	<i>Lathyrus polymorphus</i>	manystem pea	–
Fabaceae	MELU	<i>Medicago lupulina</i>	black medick	exotic
Fabaceae	MEOF	<i>Melilotus officinalis</i>	yellow sweetclover	exotic
Fabaceae	PEAR6	<i>Pediomelum argophyllum</i>	silverleaf Indian breadroot	–
Fabaceae	PSTE5	<i>Psoraleidum tenuiflorum</i>	slimflower scurfpea	–
Fabaceae	THRH	<i>Thermopsis rhombifolia</i>	golden pea	–
Fabaceae	VIAM	<i>Vicia americana</i>	American vetch	S2S4
Grossulariaceae	RIAU	<i>Ribes aureum</i>	golden currant	–
Hydrophyllaceae	ELNY	<i>Ellisia nyctelea</i>	Aunt Lucy	–
Liliaceae	ALTE	<i>Allium textile</i>	textile onion	–
Liliaceae	FRAT	<i>Fritillaria atropurpurea</i>	spotted fritillary	S2
Liliaceae	LEMO4	<i>Leucocrinum montanum</i>	common starlily	–
Linaceae	LIRI	<i>Linum rigidum</i>	stiffstem flax	S3S5
Malvaceae	SPCO	<i>Sphaeralcea coccinea</i>	scarlet globemallow	–
Melanthiaceae	TOVE2	<i>Toxicoscordion venenosum</i>	meadow deathcamas	–
Nyctaginaceae	MIAL4	<i>Mirabilis albida</i>	white four o'clock	–
Nyctaginaceae	MILI3	<i>Mirabilis linearis</i>	narrowleaf four o'clock	–
Onagraceae	OESU99	<i>Oenothera suffrutescens</i>	scarlet beeblossom	–
Papaveraceae	ARPO2	<i>Argemone polyanthemus</i>	crested pricklypoppy	–
Plantaginaceae	PLPA2	<i>Plantago patagonica</i>	woolly plantain	S2S4
Poaceae	AGCR	<i>Agropyron cristatum</i>	crested wheatgrass	exotic
Poaceae	ANGE	<i>Andropogon gerardii</i>	big bluestem	–

*Plant species not on the certified park list (also in bold).

Table 3 (continued). List of all plant species identified in Scotts Bluff National Monument plant community monitoring plots in 2018. In the Notes column, “Exotic” indicates that a species is not native to the park or, in the case where only the genus was identified, there are some species within that genus that are exotic. State or county noxious weed species are designated in the Notes column. Rare species are indicated in the Notes column with the Nebraska state ranking.

Family	Species Code	Scientific Name	Common Name	Notes
Poaceae	BOCU	<i>Bouteloua curtipendula</i>	sideoats grama	–
Poaceae	BOGR2	<i>Bouteloua gracilis</i>	blue grama	–
Poaceae	BRIN2	<i>Bromus inermis</i>	smooth brome	exotic
Poaceae	BRJA	<i>Bromus japonicus</i>	Japanese brome	exotic
Poaceae	BRTE	<i>Bromus tectorum</i>	cheatgrass	exotic
Poaceae	CALO	<i>Calamovilfa longifolia</i>	prairie sandreed	–
Poaceae	ELLA3	<i>Elymus lanceolatus</i>	thickspike wheatgrass	–
Poaceae	ELTR7	<i>Elymus trachycaulus</i>	slender wheatgrass	S1
Poaceae	HECO26	<i>Hesperostipa comata</i>	needle and thread	–
Poaceae	KOMA	<i>Koeleria macrantha</i>	prairie Junegrass	–
Poaceae	NAVI4	<i>Nassella viridula</i>	green needlegrass	–
Poaceae	PASM	<i>Pascopyrum smithii</i>	western wheatgrass	–
Poaceae	POPR	<i>Poa pratensis</i>	Kentucky bluegrass	exotic
Poaceae	SCSC	<i>Schizachyrium scoparium</i>	little bluestem	–
Poaceae	SPCR	<i>Sporobolus cryptandrus</i>	sand dropseed	–
Poaceae	VUOC	<i>Vulpia octoflora</i>	sixweeks fescue	–
Polemoniaceae	PHAN4	<i>Phlox andicola</i>	prairie phlox	–
Polemoniaceae	PHHO	<i>Phlox hoodii</i>	spiny phlox	–
Polygonaceae	RUVE2	<i>Rumex venosus</i>	veiny dock	–
Rosaceae	PRVI	<i>Prunus virginiana</i>	chokecherry	–
Rosaceae	ROAR3	<i>Rosa arkansana</i>	prairie rose	–
Rosaceae	ROWO	<i>Rosa woodsii</i>	Woods' rose	–
Rubiaceae	GAAP2	<i>Galium aparine</i>	stickywilly	–
Solanaceae	PHHI8	<i>Physalis hispida</i>	prairie groundcherry	–
Solanaceae	PHLO4	<i>Physalis longifolia</i>	longleaf groundcherry	–
Unknown Family	UNKFORB	<i>Unknown forb</i>	unknown forb	exotic
Unknown Family	UNKFORBANN	<i>Unknown annual forb</i>	unknown annual forb	exotic
Urticaceae	PAPE5	<i>Parietaria pensylvanica</i>	Pennsylvania pellitory	–
Violaceae	VINU2	<i>Viola nuttallii</i>	Nuttall's violet	–
Vitaceae	PAVI5	<i>Parthenocissus vitacea</i>	woodbine	–

Based on the total count of species observed in each plots in 2018, PCM_0023 had the highest number with 63 total species, 53 of which were native (Table 4; Figure 4). Plot PCM_0005 was also quite diverse with 44 native species. Both of these plots had high diversity because they spanned both prairie and shrubby areas. Absolute cover calculations (Table 5) reflected a greater percent of native species cover compared to exotic species cover in most plots. However, the plot in the prairie dog town (PCM_0006) and those in the area of the old golf course (LPCM_13 and LPCM_14) had a large proportion of exotic species (Table 5). Plot PCM_0018 in the southwest portion of the park was also heavily invaded (Table 5).

The NGPN monitoring crew collected woody species data in only one plot in 2018, PCM_0023 which spanned a woody draw (Figure 4). We found three live Rocky Mountain juniper trees (*J. scopulorum*) and 106 chokecherry seedlings (*P. virginiana*).

Table 4. Total number of plant species identified in each of the 23 plots monitored at Scotts Bluff National Monument in 2018. This is a count of all unique species identified in the plot using species data from point-intercept, quadrat, woody species, and target species protocols. Note that quadrat data was not collected from the FPCM, LPCM, and the five PCM plots read by NGPFire (PCM_0004, PCM_0013, PCM_0018, PCM_0020, and PCM_0024), resulting in a lower species count.

MacroPlot Name	Exotic Species	Native Species	Total species
SCBL_FPCM_0097	6	12	18
SCBL_FPCM_0130	5	11	16
SCBL_FPCM_0165	5	6	11
SCBL_FPCM_0221	5	9	14
SCBL_FPCM_0268	4	13	17
SCBL_FPCM_1005	5	16	21
SCBL_LPCM_11	3	9	12
SCBL_LPCM_12	3	5	8
SCBL_LPCM_13	5	4	9
SCBL_LPCM_14	6	11	17
SCBL_PCM_0004*	6	11	17
SCBL_PCM_0005	8	44	52
SCBL_PCM_0006	9	10	19
SCBL_PCM_0007	8	38	46
SCBL_PCM_0009	10	21	31
SCBL_PCM_0010	7	25	32
SCBL_PCM_0011	10	36	46
SCBL_PCM_0012	10	25	35

* Quadrat data not collected in these PCM plots read by NGPFire, resulting in a lower species count.

Table 4 (continued). Total number of plant species identified in each of the 23 plots monitored at Scotts Bluff National Monument in 2018. This is a count of all unique species identified in the plot using species data from point-intercept, quadrat, woody species, and target species protocols. Note that quadrat data was not collected from the FPCM, LPCM, and the five PCM plots read by NGPFire (PCM_0004, PCM_0013, PCM_0018, PCM_0020, and PCM_0024), resulting in a lower species count.

MacroPlot Name	Exotic Species	Native Species	Total species
SCBL_PCM_0013*	4	17	21
SCBL_PCM_0018*	7	11	18
SCBL_PCM_0020*	6	18	24
SCBL_PCM_0023	10	53	63
SCBL_PCM_0024*	2	12	14

* Quadrat data not collected in these PCM plots read by NGPFire, resulting in a lower species count.

Table 5. Absolute percent cover of native and exotic plant species in plots monitored at Scotts Bluff National Monument in 2018. Absolute percent cover is calculated using the point-intercept data. This includes overlapping species canopies, which can result in values greater than 100%.

Plot	Absolute % Exotic Cover	Absolute % Native Cover
SCBL_FPCM_0097	49	175
SCBL_FPCM_0130	67	105
SCBL_FPCM_0165	40	130
SCBL_FPCM_0221	97	108
SCBL_FPCM_0268	69	118
SCBL_FPCM_1005	44	169
SCBL_LPCM_11	37	134
SCBL_LPCM_12	12	139
SCBL_LPCM_13	76	64
SCBL_LPCM_14	70	72
SCBL_PCM_0004	51	140
SCBL_PCM_0005	27	112
SCBL_PCM_0006	82	39
SCBL_PCM_0007	45	134
SCBL_PCM_0009	41	127
SCBL_PCM_0010	63	62
SCBL_PCM_0011	52	114
SCBL_PCM_0012	26	141
SCBL_PCM_0013	43	150

Table 5 (continued). Absolute percent cover of native and exotic plant species in plots monitored at Scotts Bluff National Monument in 2018. Absolute percent cover is calculated using the point-intercept data. This includes overlapping species canopies, which can result in values greater than 100%.

Plot	Absolute % Exotic Cover	Absolute % Native Cover
SCBL_PCM_0018	129	131
SCBL_PCM_0020	29	168
SCBL_PCM_0023	20	101
SCBL_PCM_0024	12	158



Figure 4. Long-term monitoring plot PCM_0023 at Scotts Bluff National Monument is located in a woody draw and was the only location in 2018 to have tree species present. It was also the most diverse plot. Photograph courtesy of the National Park Service.

Disturbances occurred at many of the plots visited in 2018 (Table 6). There was a variety of disturbances observed, including fire and animal trails. One of the most common disturbance was from small mammals that dug up and exposed mounds of soil (see bottom of Figure 4). This year, NGPN and NGPFire began assessing the total area of exposed soil disturbance in each plot regardless of cause. In later analyses, we hope to understand whether this exposed soil contributed to the success of annual bromes.

Table 6. Disturbance types and occurrence in plant community monitoring plots visited in 2018 at Scotts Bluff National Monument.

Plot	Disturbance Type	Area (m²)
SCBL_FPCM_0097	Soil Disturbance	8
SCBL_FPCM_0130	Soil Disturbance	10
SCBL_FPCM_0165	Fire	1000
SCBL_FPCM_0165	Small Mammal	2
SCBL_FPCM_0221	Fire	1000
SCBL_FPCM_0221	Soil Disturbance	7
SCBL_LPCM_11	Small Mammal	20
SCBL_LPCM_11	Soil Disturbance	20
SCBL_LPCM_12	Small Mammal	1
SCBL_LPCM_12	Soil Disturbance	1
SCBL_LPCM_13	Animal Trail	12
SCBL_LPCM_13	Small Mammal	1
SCBL_LPCM_14	Small Mammal	12
SCBL_LPCM_14	Soil Disturbance	12
SCBL_PCM_0005	Erosion	5
SCBL_PCM_0005	Small Mammal	2
SCBL_PCM_0005	Soil Disturbance	7
SCBL_PCM_0006	Prairie Dog	1000
SCBL_PCM_0006	Soil Disturbance	30
SCBL_PCM_0007	Small Mammal	20
SCBL_PCM_0007	Soil Disturbance	20
SCBL_PCM_0009	Animal Trail	25
SCBL_PCM_0009	Small Mammal	5
SCBL_PCM_0009	Soil Disturbance	5
SCBL_PCM_0010	Small Mammal	55
SCBL_PCM_0010	Soil Disturbance	55
SCBL_PCM_0011	Animal Trail	30
SCBL_PCM_0011	Graz	10
SCBL_PCM_0011	Small Mammal	50
SCBL_PCM_0011	Soil Disturbance	50
SCBL_PCM_0012	Road	0
SCBL_PCM_0012	Small Mammal	28

Table 6 (continued). Disturbance types and occurrence in plant community monitoring plots visited in 2018 at Scotts Bluff National Monument.

Plot	Disturbance Type	Area (m²)
SCBL_PCM_0012	Soil Disturbance	28
SCBL_PCM_0013	Fire	1000
SCBL_PCM_0013	Soil Disturbance	40
SCBL_PCM_0018	Soil Disturbance	4
SCBL_PCM_0020	Soil Disturbance	7
SCBL_PCM_0023	Animal Trail	18
SCBL_PCM_0023	Off-Road	7
SCBL_PCM_0023	Soil Disturbance	2
SCBL_PCM_0023	Wallow	5
SCBL_PCM_0024	Soil Disturbance	12

Further Analysis

This Data Report is intended to provide a basic review of the data collected during the NGPN and NGPFire monitoring team's 2018 visit to Scotts Bluff National Monument. All data included in this report is available upon request from the Northern Great Plains Inventory and Monitoring Network, as well as in the archives found in the [IRMA Data Store](#).

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